AMENDMENTS TO THE CLAIMS

Please amend the claims as set forth hereinbelow.

1. **(currently amended)** An optical apparatus, comprising:
   a semiconductor substrate having a substrate surface;
   an entrance face formed on the substrate at the substrate surface and forming an angle therewith;
   a reflecting face formed on the substrate at the substrate surface and forming an acute angle therewith, the reflecting face positioned relative to the entrance face so that at least a portion of an optical beam transmitted through the entrance face into the substrate is internally reflected from the reflecting face toward the substrate surface; and
   a photodetector active region formed at the substrate surface, the active region being positioned so that at least a portion of the optical beam reflected from the reflecting face impinges on at least a portion of the active ~~region.~~ region,
   wherein an incident optical beam propagating substantially parallel to the substrate surface and transmitted through the entrance face into the substrate is refracted away from the substrate surface.

2. **(original)** The apparatus of Claim 1, wherein the photodetector active region comprises a p-i-n photodiode.

3. **(original)** The apparatus of Claim 2, wherein the substrate comprises InP, and wherein the p-i-n photodiode comprises an InP n-layer, an InGaAs i-layer, and an InP p-layer.

4. **(original)** The apparatus of Claim 1, wherein the photodetector active region comprises an avalanche photodiode.

5. **(cancelled)**

6. **(cancelled)**

7. **(currently amended)** The apparatus of ~~Claim 5,~~ Claim 1, wherein the entrance face forms an angle with the substrate surface ~~between about 85° and~~ greater than 90° and less than about 105°.

8. **(original)** The apparatus of Claim 5, wherein the entrance face includes an anti-reflection coating thereon.

9. **(original)** The apparatus of Claim 5, wherein the entrance face includes a wavelength-selective filter coating thereon.

10. **(original)** The apparatus of Claim 1, wherein the reflecting face forms an angle with the substrate surface between about 40° and about 70°.

11. **(original)** The apparatus of Claim 10, wherein an incident optical beam propagating substantially parallel to the substrate surface and transmitted through the entrance face into the substrate undergoes total internal reflection from the reflection face.

12. **(original)** The apparatus of Claim 10, wherein the reflecting face forms an angle with the substrate surface between about 51° and about 60°.

13. **(original)** The apparatus of Claim 10, wherein the reflecting face includes a reflective coating thereon.

14. **(original)** The apparatus of Claim 1, wherein the photodetector active region and the reflecting face are separated by more than about 5 μm at the substrate surface.

15. **(original)** The apparatus of Claim 1, wherein the entrance face and the reflecting face are separated by more than about 50 μm and less than about 250 μm at the substrate surface.

16. **(currently amended)** The apparatus of Claim 1, further comprising at least two electrical contacts formed at the substrate surface and connected to the photodetector active ~~area.~~ region.

17. **(original)** The apparatus of Claim 1, wherein the entrance face and the reflecting face are arranged so that the optical beam, if transmitted through the entrance face at normal incidence, defines a substantially vertical plane of incidence relative to the reflecting face.

18. **(original)** The apparatus of Claim 1, wherein the entrance face and the reflecting face are arranged so that the optical beam, if transmitted through the entrance face

at normal incidence, defines a non-vertical plane of incidence relative to the reflecting face.

19. **(original)** The apparatus of Claim 1, wherein the reflecting face is substantially parallel to a crystal plane of the substrate.

20. **(currently amended)** The apparatus of Claim 1, wherein ~~at least one of~~ the entrance face ~~and~~ or the reflecting face is curved.

21. **(original)** The apparatus of Claim 1, further comprising a transmission optical element positioned on a second substrate, wherein the semiconductor substrate is mounted on the second substrate with the substrate surface facing the second substrate so that at least a portion of an optical beam emerging from an end face of the transmission optical element is transmitted through the entrance face into the substrate, is internally reflected from the reflecting face, and impinges on at least a portion of the photodetector active region.

22. **(original)** The apparatus of Claim 21, wherein the transmission optical element is a planar waveguide formed on the second substrate.

23. **(original)** The apparatus of Claim 21, wherein the transmission optical element is an optical fiber mounted in a groove on the second substrate.

24. **(currently amended)** The apparatus of Claim 21, wherein the optical beam is centered on the entrance face between about 2.5 μm ~~below a level of the photodetector active area~~ and about 50 μm below the level of the photodetector active ~~area.~~ region.

25. **(original)** The apparatus of Claim 21, further comprising a substantially transparent embedding medium substantially filling an optical path between the end face of the transmission optical element and the entrance face.

26. **(original)** The apparatus of Claim 21, wherein the mounted semiconductor substrate and the end face of the transmission optical element are encapsulated.

27. **(original)** The apparatus of Claim 1, further comprising groove formed on the substrate and an optical fiber mounted on the substrate in the groove so that at least a portion of an optical beam emerging from an end face of the optical fiber is

transmitted through the entrance face into the substrate, is internally reflected from the reflecting face, and impinges on at least a portion of the photodetector active region.

28. **(currently amended)** A method for making an optical apparatus, comprising:

forming an entrance face on a semiconductor substrate at a substrate surface, the entrance face forming an angle with the substrate surface;

forming a reflecting face on the substrate at the substrate surface, the reflecting face forming an acute angle with the substrate surface and positioned relative to the entrance face so that at least a portion of an optical beam transmitted through the entrance face into the substrate is internally reflected from the reflecting face toward the substrate surface; and

forming a photodetector active region at the substrate surface, the active region being positioned so that at least a portion of the optical beam reflected from the reflecting face impinges on at least a portion of the active ~~region.~~ region,

wherein an incident optical beam propagating substantially parallel to the substrate surface and transmitted through the entrance face into the substrate is refracted away from the substrate surface.

29. **(original)** The method of Claim 28, wherein the photodetector active region comprises a p-i-n photodiode.

30. **(original)** The method of Claim 29, wherein the substrate comprises InP, and wherein the p-i-n photodiode comprises an InP n-layer, an InGaAs i-layer, and an InP p-layer.

31. **(original)** The method of Claim 28, wherein the photodetector active region comprises an avalanche photodiode.

32. **(cancelled)**

33. **(cancelled)**

34. **(currently amended)** The method of ~~Claim 32,~~ Claim 28, wherein the entrance face forms an angle with the substrate surface ~~between about 85° and~~ greater than 90° and less than about 105°.

35. **(original)** The method of Claim 32, further comprising forming an anti-reflection coating on the entrance face.

36. **(original)** The method of Claim 32, further comprising forming a wavelength-selective filter coating on the entrance face.

37. **(original)** The method of Claim 28, wherein the reflecting face forms an angle with the substrate surface between about 40° and about 70°.

38. **(original)** The method of Claim 37, wherein an incident optical beam propagating substantially parallel to the substrate surface and transmitted through the entrance face into the substrate undergoes total internal reflection from the reflection face.

39. **(original)** The method of Claim 37, wherein the reflecting face forms an angle with the substrate surface between about 51° and about 60°.

40. **(original)** The method of Claim 37, further comprising forming a reflective coating on the reflecting face.

41. **(original)** The method of Claim 28, wherein the photodetector active region and the reflecting face are separated by more than about 5 μm at the substrate surface.

42. **(original)** The method of Claim 28, wherein the entrance face and the reflecting face are separated by more than about 50 μm and less than about 250 μm at the substrate surface.

43. **(original)** The method of Claim 28, further comprising forming at the substrate surface at least two electrical contacts connected to the photodetector active area.

44. **(original)** The method of Claim 28, wherein the entrance face and the reflecting face are arranged so that the optical beam, if transmitted through the entrance face at normal incidence, defines a substantially vertical plane of incidence relative to the reflecting face.

45. **(original)** The method of Claim 28, wherein the entrance face and the reflecting face are arranged so that the optical beam, if transmitted through the entrance face at normal incidence, defines a non-vertical plane of incidence relative to the reflecting face.

46. **(original)** The method of Claim 28, wherein the reflecting face is substantially parallel to a crystal plane of the substrate.

47. **(original)** The method of Claim 46, wherein the reflecting face is formed by an etch process that is selective for at least two non-parallel crystal planes of the substrate, and the reflecting face is formed along one of the crystal planes.

48. **(currently amended)** The method of Claim 28, wherein ~~at least one of~~ the entrance face ~~and~~ or the reflecting face is curved.

49. **(original)** The method of Claim 28, further comprising positioning a transmission optical element on a second substrate, and mounting the semiconductor substrate on the second substrate with the substrate surface facing the second substrate so that at least a portion of an optical beam emerging from an end face of the transmission optical element is transmitted through the entrance face into the substrate, is internally reflected from the reflecting face, and impinges on at least a portion of the photodetector active region.

50. **(original)** The method of Claim 49, wherein the transmission optical element is a planar waveguide formed on the second substrate.

51. **(original)** The method of Claim 49, wherein the transmission optical element is an optical fiber mounted in a groove on the second substrate.

52. **(original)** The method of Claim 49, wherein the optical beam is centered on the entrance face no less than about 2.5 μm below a level of the photodetector active area and no more than about 50 μm below the level of the photodetector active area.

53. **(original)** The method of Claim 49, further comprising substantially filling an optical path between the end face of the transmission optical element and the entrance face with a substantially transparent embedding medium.

54. **(original)** The method of Claim 49, further comprising encapsulating the mounted semiconductor substrate and the end face of the transmission optical element.

55. **(original)** The method of Claim 28, further comprising forming a groove on the substrate and mounting an optical fiber on the substrate in the groove so that at

least a portion of an optical beam emerging from an end face of the optical fiber is transmitted through the entrance face into the substrate, is internally reflected from the reflecting face, and impinges on at least a portion of the photodetector active region.

56. **(currently amended)** A method for making an optical apparatus, comprising:

forming multiple corresponding pairs of entrance faces and reflecting faces at a surface of a common semiconductor substrate wafer, each entrance face forming an angle with the wafer surface, each reflecting face forming an acute angle with the wafer surface, each reflecting face positioned so that at least a portion of an optical beam transmitted through the corresponding entrance face into the substrate wafer is internally reflected from the reflecting face toward the wafer surface;

forming, for each pair of corresponding entrance faces and reflecting faces, a corresponding photodetector active region at the wafer surface, each active region being positioned relative to the corresponding entrance face and reflecting face so that at least a portion of the optical beam reflected from the corresponding reflecting face impinges on at least a portion of the active region; and

dividing the semiconductor wafer into multiple photodetector substrates, each photodetector substrate having at least one set of corresponding entrance face, reflecting face, and photodetector active ~~region.~~ region,

wherein an incident optical beam propagating substantially parallel to the substrate surface and transmitted through the entrance face into the substrate is refracted away from the substrate surface.

57. **(currently amended)** An optical apparatus, comprising:

a semiconductor substrate;

a photodetector active region integrally formed on the semiconductor substrate;

a low-index optical medium formed on the semiconductor substrate with an internal reflector positioned at the photodetector active region, so that at least a portion of an optical beam propagating within the ~~transmission member~~

optical medium is internally reflected from the ~~reflecting face~~ internal reflector onto at least a portion of the active region.

58. **(original)** The apparatus of Claim 57, wherein the optical medium comprises a substantially transparent dielectric slab.

59. **(currently amended)** The apparatus of Claim 58, further comprising a transmission optical element positioned on a second substrate, wherein the semiconductor substrate is mounted on the second substrate so that at least a portion of an optical beam emerging from an end face of the transmission optical element is transmitted through an entrance face of the dielectric slab, is internally reflected from the ~~reflecting face,~~ internal reflector, and impinges on at least a portion of the photodetector active region.

60. **(original)** The apparatus of Claim 59, wherein the transmission optical element is a planar waveguide formed on the second substrate.

61. **(original)** The apparatus of Claim 59, wherein the transmission optical element is an optical fiber mounted in a groove on the second substrate.

62. **(original)** The apparatus of Claim 57, wherein the optical medium comprises a planar waveguide formed on the semiconductor substrate.

63. **(currently amended)** The apparatus of Claim 62, further comprising a transmission optical element positioned on a second substrate, wherein the semiconductor substrate is mounted on the second substrate so that at least a portion of optical power propagating through the transmission optical element on the second substrate enters the planar waveguide on the semiconductor substrate, is internally reflected from the ~~reflecting face,~~ internal reflector, and impinges on at least a portion of the photodetector active region.

64. **(original)** The apparatus of Claim 63, wherein the transmission optical element is a planar waveguide formed on the second substrate and transverse-coupled with the planar waveguide on the semiconductor substrate.

65. **(original)** The apparatus of Claim 63, wherein the transmission optical element is a planar waveguide formed on the second substrate, and optical power emerging

from an end face of the planar waveguide on the second substrate is transmitted through an entrance face of the planar waveguide on the semiconductor substrate.

66. **(original)** The apparatus of Claim 63, wherein the transmission optical element is an optical fiber mounted in a groove on the second substrate, and optical power emerging from an end face of the optical fiber is transmitted through an entrance face of the planar waveguide on the semiconductor substrate.

67. **(currently amended)** The apparatus of Claim 57, wherein the optical beam undergoes total internal reflection at the ~~reflecting face.~~ internal reflector.

68. **(currently amended)** The apparatus of Claim 57, wherein the ~~reflecting face~~ internal reflector includes a reflective coating thereon.